TOOL DIE MACHINE
PROGRESS
THE NATIONAL TOOL AND DIE JOURNAL

TOOLS, DIES, JIGS, FIXTURES, MOULDS, GAGES, MACHINES
Design and Engineering
PRECISION SPECIALTIES
STAMPING and PARTS PRODUCTION
Official Publication
Special Tool, Die & Machine Shop Industry

MAY,
1937

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END MILLS

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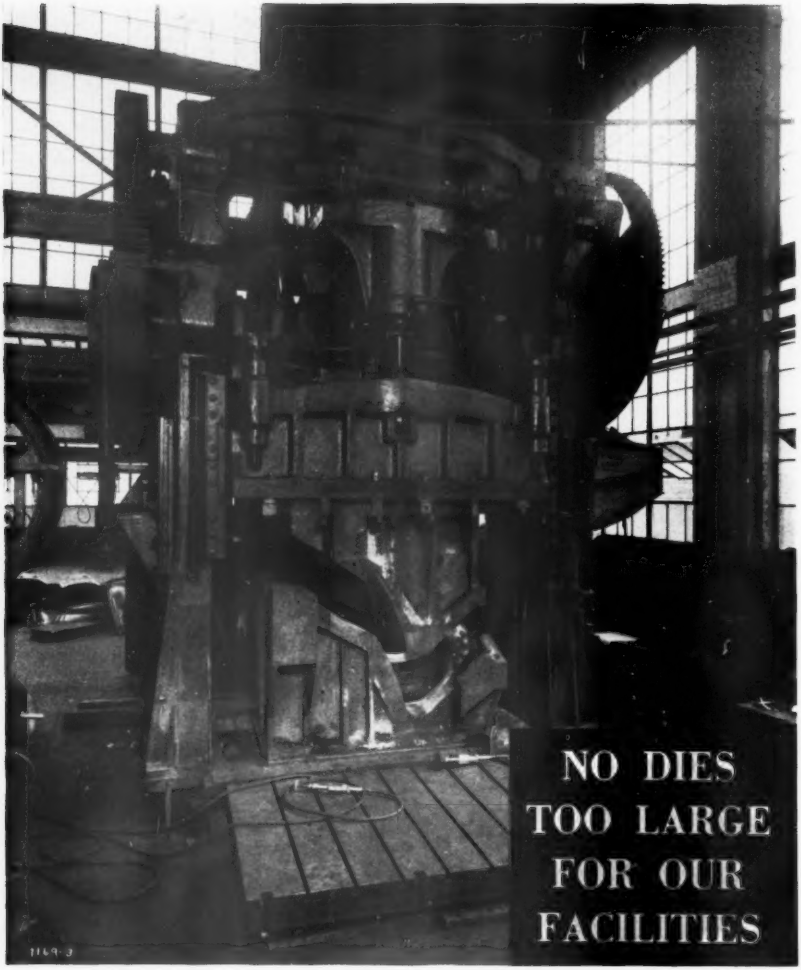

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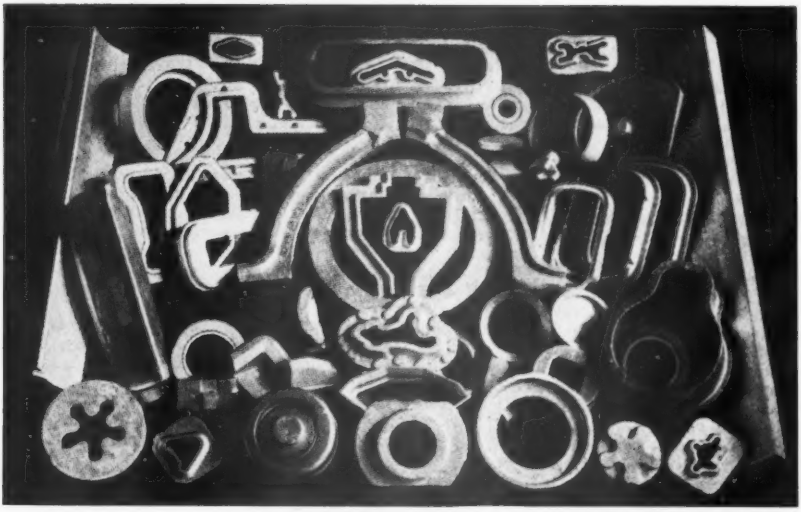

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How to Select and Heat Treat the Proper Steel *to Make Any Kind of Tool*

Here at last is a book for the man who makes tools—a plain, practical, common sense explanation of how to make tools that last longer. It will help you show your company how to get bigger production and how to bring down tool costs.

TOOL STEEL SIMPLIFIED

By FRANK R. PALMER

Assistant to the President
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315 Pages, 6x9. 205 Illustrations, $1.00

This is the first book to give the tool maker simplified methods for the selection and heat treatment of tool steel.

It is a handbook of modern practice for the men who are responsible for your tools. You will want it:

—to check up on your methods
—to get quicker answers to tool problems
—to save time and effort
—to simplify your work

READ THESE COMMENTS:

". . . a valuable text book for apprentices and journeymen, and an equally valuable handbook for designers and others concerned with the use of tool steel."

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". . . Part Two offers a workable method by which anyone can make changes in the type of tool steel he is using with some understanding of the theory in back of his efforts."

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K. H. CONDIT
Editor, American Machinist

315 Pages
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Just a few of the problems this book will answer for you:

HOW to stop tools from warping—How to avoid grinding checks—How to make tools wear longer—What furnace atmosphere shall I use?—How to make the spark test—What is a Monotron Hardness Tester?—Shall I quench in fresh water or brine?—How does tool design affect cracking?—What is the Shepherd P-F Test?—How to make tools that won't break—How to prevent size change —How to be a trouble shooter.

For the Man Who Wants to Get Bigger Production and Lower Costs

THE CARPENTER STEEL CO.
Dept. A-9 READING, PENNA.

Please send me postpaid the convenient new 315 page handbook—"Tool Steel Simplified." I am inclosing $1.00. (Price $3.50 outside U. S. A.)

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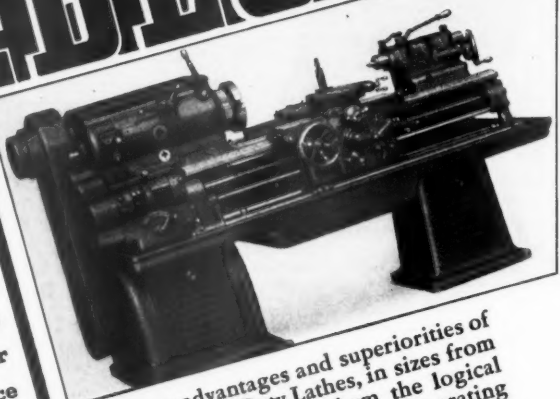

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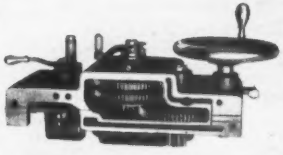
The many advantages and superiorities of LeBlond Heavy Duty Lathes, in sizes from 12″ to 36″, have made them the logical choice of all critical buyers. Incorporating every new proved development and, in addition, many exclusive features, LeBlond offers greater value per dollar invested, sharp production economies, more efficient, continuous, trouble-free operation. You cannot afford not to investigate LeBlond Lathes. Send for free literature.



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STRONG-ARM JOE SAYS:

BOY! HERE'S A BOOK WITH ALL THE ANSWERS!

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FREE!

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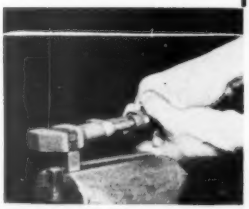
You want to know what screws have to do with back orders? I'll tell you!

When your setups stay set, when you sock 'em down on the toughest jobs and they stay socked . . . boy, you get PRODUCTION!

I thought I knew all about screws, but Mac-its have just got out a new kind of catalog that's a real shop handbook if I ever saw one. Right now we're highballing every order that comes in . . . and, believe me, Mac-its sure are helpin' us eat up those production schedules!



Put your champ screw buster on this Mac-its free test set. He'll show you how to cut production costs.

The Strong, Carlisle & Hammond Co.
1392 West Third St., Cleveland, Ohio

Kindly send me, without obligation, the new Mac-its catalog ☐ test set ☐ advise nearest distributor ☐

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City ..... State.....

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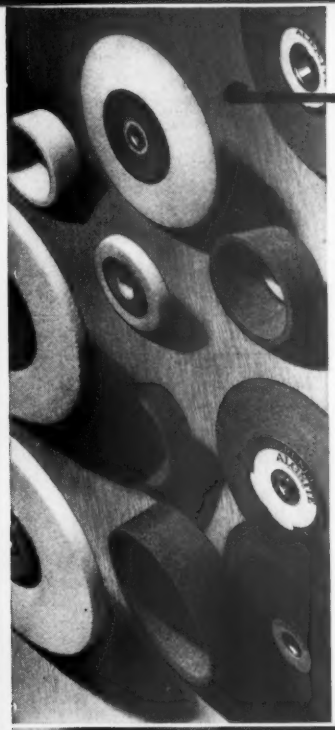

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In the forty or more years of Carborundum service to industry one of our most outstanding successes has been these Aloxite Brand Aluminum Oxide Tool Room Wheels—the "AA" and the "270" Bond. The "AA" Wheel—the white wheel—is for that refined, exacting close limit work on special tools. It has the perfect action of the perfect tool grinding wheel, clean, cool cutting and requiring but little dressing. A wheel that is flexible in its applications—because of its ability to take light or heavy cuts over wide contact areas—to grind successfully a wide range

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ARE GRINDING A NEW CHAPTER IN TOOL ROOM HISTORY

of steel. In the "270" Bond wheel you have the same clean, cool cutting qualities—a long lived wheel built especially to take care of the high production of duplicated work.

For that important task of grinding, sharpening and reconditioning of cemented carbide tools, Carborundum made another distinctive contribution to industry by introducing the Carborundum Brand Diamond Wheels and the Carborundum Brand Silicon Carbide Green-Grit Wheels.

Send for book "A Treatise on the Grinding of Cemented Carbides." Send for Tool Grinding Book—This 140-page book is packed with information. Completely illustrated.

THE CARBORUNDUM COMPANY
REG. U. S. PAT. OFF.
NIAGARA FALLS, N. Y.
(Carborundum and Aloxite are registered trade-marks of The Carborundum Company)

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The Bunell Method for Repairing and Reclaiming Dies and Punches

EFFECTS SAVINGS as HIGH as 90% of ORIGINAL COST

Restores worn forming and cutting edges without annealing... No drawing of temper... No rehardening... Let us put your discarded dies back into active, profitable service.

New edges compare favorably with high-speed steel.

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We are designers and builders of

TOOLS - DIES
SPECIAL MACHINERY

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Our facilities for large work include:

3 Lucas Precision Horizontal Mills — largest No. 42 oversize pattern...No. 6 Swiss jig borer—the largest capacity...Gray Maxi-Service Open-side Planer — table capacity 72" x 240"... *May we estimate your work?*

THE BUNELL MACHINE & TOOL CO.
1600 EAST 24th ST. PRospect 2681 CLEVELAND, OHIO

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HIGH CARBON HIGH CHROME
COMPOSITE PUNCH AND DIE

This Ajax Composite Punch and Die was designed and built to blank plate of ¾ inch thickness. Size 33 in. x 18½ in.

REDUCE YOUR DIE COSTS WITH

AJAX
COMPOSITE DIE SECTIONS

ANY SIZE — ANY SHAPE — ANY GRADE

- - - MADE TO ANY SPECIFICATION - - -

Write for Information and Valuable Booklet

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ALLOY HY-TEN STEELS

ALSO POPULAR S.A.E. ALLOY GRADES

SUITABLE FOR A WIDE VARIETY OF USES

HY-TEN "M" TEMPER

Oil Hardening Alloy Steel

For parts requiring great hardness, density of structure, resistance to wear, combined with toughness.

HY-TEN B No. 3X

.50 C. High Man.-Chrome-Moly

Machinable in heat-treated condition at hardnesses up to 42 Rockwell "C" (401 Brinell) or even higher.

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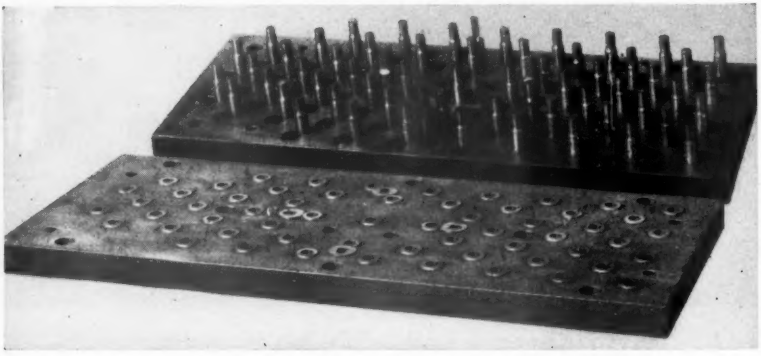
MR. DIE MAKER: WE SUGGEST THIS METHOD FOR YOUR PROFIT INSURANCE



A Hovis Screwlock group punch plate and corresponding button die plate.

These plates, as illustrated, were delivered to a contract die shop, with guaranteed accuracy at a fixed price. . . . A standard die shoe—fully guaranteed by the maker—was added. Standard springs, screws, and dowels, all obtainable at fixed prices—were used. . . . RESULT: A complete die except for the stripper and the mounting of the two plates which represent a labor cost of not more than 10% of gross selling price. Thus Guaranteed Standard Parts assure your profit. . . . Our experience is at your service.

Write for descriptive circular of Screwlock patented principle.

HOVIS SCREWLOCK COMPANY

3129 EAST LARNED ST., DETROIT, MICHIGAN

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Twelve Months • of • Progress

THIS May Issue of Tool·Die·Machine PROGRESS begins a new year of publication.

It is fitting, therefore, that results of the past twelve months be analyzed. Everyone interested in the designing and building of tools, dies and special machines, everyone whose products require their use, manufacturers of materials and parts which enter into their construction, builders of machine tools and shop equipment of the many kinds which are used in Tool·Die·Machine Shops — all will be interested in the progress of T·D·M· PROGRESS.

The twelve issues of Tool·Die·Machine PROGRESS since March 1936 have made history—at least in a small way. Back in March 1936, just six advertisers had the courage—we like to think of it as foresight—to buy space. To these we shall be everlastingly grateful.

All of them continued into succeeding issues, and two of them have carried on through to the present without interruption. They are Danly Machine Specialties, Inc., of Chicago, and Continental Machine Specialties, Inc., of Minneapolis. We have had the satisfaction of having received upon several occasions from both of these advertisers, the assurance that Tool·Die·Machine PROGRESS has justified their expectations and brought to them a most satisfactory volume of business.

The progress of Tool·Die·PROGRESS did not lie along a path of sunshine and roses, and we acknowledge with heartfelt gratitude the encouragement from members of the TDM Industry, particularly in Cleveland and Detroit, when the way wasn't so bright, and instead of roses we saw only boulders. Their encouragement lay not alone in words of assurance that our idea was sound, but it also took the form of that extremely necessary support — actual advertising contracts.

Now, after a year of publication in its ever expanding form, we have had the satisfaction of knowing that these earlier advertisers have been rewarded. From advertisers themselves have come these words of assurance:

"Our men see T·D·M PROGRESS in almost every shop they call on."

"Your publication has turned out to be a very worthwhile advertising medium and we certainly commend you for your splendid efforts in putting out such a paper."

"There has never been a month when we did not get a gratifying number of responses. (They) were of high caliber and represented good prospects . . . We feel you have done a real job."

"We are indeed gratified with the recent order from . . . and thank you for your attention. We do have much faith in your 'dandy' little PROGRESS."

We could continue to quote commendatory expressions from letters received from advertisers and readers alike, but we must retain at least a shred of modesty.

During the last twelve months, national advertisers and agencies have checked us thoroughly and have come to recognize Tool·Die·Machine PROGRESS as unique in its place among industrial publications. In consequence thereof, twelve months of effort have recorded growth from a sixteen-page booklet to a forty-page magazine; six advertisers have grown to more than fifty in each issue and circulation has expanded from a scant 3,500 to 9,000.

Thanks again to every firm and every individual whose cooperation and encouragement have made this possible. We pledge you our continuing sincere effort to make Tool·Die·Machine PROGRESS interesting and valuable to readers and advertisers alike.

GEORGE J. HUEBNER,
Editor.

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ITCO
PRODUCTS
Reg. U.S. Pat. Off.

THE

INTERNATIONAL
TOOL COMPANY

J. J. KOHL,
Pres.

DAYTON, OHIO

A Thought . . .

on CHISELING

Chiseling is a harsh word;—yet quite appropriate for the practice it represents.

It might be defined to embrace that practice on the part of sellers of cutting a price below the cost of production (material, labor and normal overhead) plus a reasonable profit.

It is commonly "ASSUMED" that a buyer thereby derives a benefit in the form of a so-called bargain.

In tools and dies, however, the "CHISELING" does not stop with the setting of the cut price. It continues on throughout the process of manufacture. It takes the form of inferior material substitutes, slipshod workmanship, haphazard heat treating, unreliable or inadequate service, unethical business practices and many other ingenious expedients, often well concealed or impossible of ready discovery.

. . . . CHISELED PRICES BEGET CHISELED PRODUCTS . . . . . .

Such products are then dumped into the lap of the buyer to live with.

From then on the sins of the chiseling practice are visited upon the disappointed buyer for the life of the equipment.

Can it not, therefore, be fairly said that every buyer and user of special tools and dies must eternally—

BEWARE OF THE HAZARDS AND HIGHER COSTS OF THE CHEAPER PRICE?—

NOTE—There will appear on these pages, from time to time, various "Thoughts" pertinent to business in general and the Tool and Die Industry in particular. We invite comment.

ITCO PRODUCTS
Reg. U.S. Pat. Off.

Our Specialty—

JIG,
FIXTURE,
DIE,
GAGE
AND
MACHINE DESIGNING

—o—

COMPLETE
TOOL ROOM
AND
MACHINE SHOP
EQUIPMENT

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DIES AND TOOLS

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PATTERN WORKS, Inc.
DAYTON, O.
WOOD AND METAL
PATTERNS

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ADJUSTABLE WHILE RUNNING!

The PRECISION
UNIVERSAL TOOL HEAD

Presents

SPEED, RANGE, ACCURACY

and above all

ADJUSTABILITY

• **The Precision Universal Tool Head** can be adjusted to a fraction of a thousandth, **without stopping either tool or machine!**

•

For Boring, Counterboring, Recessing, Trepanning, Undercutting, Facing, etc.

•

Bulletins and additional Information sent on Request.

THE PRECISION TOOL COMPANY, Bridgeport, Conn.

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Tool • Die • Machine
PROGRESS
The National Tool and Die Journal

May, 1937 Vol. 3, No. 2

An Editorial

"If Men Were Only Willing To Think"

BY N. A. WOODWORTH, Vice President
Special Tool, Die & Machine Shop Institute

This article, originally written for Tool Tips, house organ of the Ex-Cell-O Aircraft & Tool Corporation of which Mr. Woodworth is President, appealed to us so forcefully as a forthright, common sense argument for sincere cooperative thought and action between employer and employee that we asked permission to reprint it.—Editor.

A GREAT American educator once said, "ALL the problems of the world could be settled easily, if men were only willing to THINK." If this statement is true — and I believe it is — just THINK of the suffering that Humanity would be spared, if the spirit of this thought were actually applied in truth and in fact.

In the field of science, man HAS made great progress by the use of his brain. With the speed of light he sends his voice, through the ether, to the "ends of the earth." He casts his image, in natural color, on a silver screen and makes it walk and talk as if human. With ease and comfort he soars through the sky, speeds across the earth, and travels beneath the waters of the sea. But utterly — miserably, he has failed to do the thing that would bring peace and lasting happiness to his kind.

SOLVE THE PROBLEM OF HUMAN RELATIONSHIP, THROUGH A FRIENDLY MEETING OF MINDS, FOR THE COMMON GOOD.

If man would honestly apply this simple remedy, most of his troubles would disappear. Nations would adjust differences with pen and ink, instead of bullets and blood. Dangerous political and industrial strife, now apparent, would come to a permanent end.

To me, the present method of settling questions between employer and employee, seems so unnecessary. So useless and hopelessly void of accomplishing good for those concerned. It's like an old-fashioned poker game — play all night, but everyone loses — that is, all except the organization sponsoring the game. So it is with the "Boss" and the men. They both play the game and play it hard — but they both lose. Only the group who "toil not, neither do they spin" is the winner.

Whether we work in factory, office, bank, or mine — individual success is dependent upon the success of our fellow workmen. Labor in office or factory — money in bank — raw material in the mine — is of no benefit taken separately. But with money to purchase raw material, factory labor to fashion it into salable goods, office labor to manage its production and distribution — benefits are universal.

I am fully convinced that factories do not have to be closed — payrolls stopped — bread lines formed — property destroyed or confiscated — law and order abandoned—just to settle a difference between the minds of men. Such matters CAN be adjusted peaceably, quietly, satisfactorily, and without interruption of our daily life—if FREE American men and women will meet each other on common ground, face to face, and T-H-I-N-K.

"Tool Steel Simplified"

By FRANK R. PALMER, Assistant to the President
The Carpenter Steel Company

A Review, with excerpts and illustrations, of this "Handbook of Modern Practice for the Man Who Makes Tools."

Why are alloys put into tool steel?

"Alloys are put into steel to enable it to do things that a plain carbon steel cannot do."

What are these *extra* requirements?

"1. To secure greater hardness for cutting or wear resistance.
2. To secure greater toughness or strength.
3. To make the steel hold its size and shape accurately during hardening, or to make the hardening operation safer.
4. To give the steel "red hardness," or the ability to do its work when the tool is heated so hot that a plain carbon steel would soften."

Every man engaged in the building of tools and dies, whose duties include the selection of the steels which will most nearly fulfill the requirements which their use entails, assumes a great responsibility. He passes up no opportunity to acquire knowledge upon a subject which is so vital to his business or his trade.

It is most regrettably true that helpful, authoritative writings describing simply and practically the technique of "industrial manufacture" in its broadest application, are exceedingly few in number. And among those we do have today, catalogs and sales literature occupy an important place. In the Buyer's Forum

Half-ton Coreless Electric Induction Furnace.

Newest type of furnace for making high grade tool steel. Operates on principle of electric transformer, primary current being high frequency alternating which is passed through a water cooled copper coil which surrounds the melting crucible. Requires only few minutes for an entire charge to be melted, and in process the steel is stirred and mixed continuously by action of the induced electric currents, something which no other melting furnace can do.

in the February issue of Tool·Die·Machine PROGRESS, we pointed out that "such sales promotion literature sets forth facts and figures which have been established by elaborate research and expensive development, and these books are frequently considered of such value as to justify even international copyright."

"Tool Steel Simplified" by Frank R. Palmer is such a handbook of modern practice for the man who makes tools and dies, and its pages are alive with facts as vital to his business or his trade as the very blueprints he must have to build a specific tool or die.

Let a builder of tools and dies build any kind of a tool, die, jig, fixture, mold, gage, or special machine, and he is expected to assume the responsibility for its satisfactory operation. Specifically, then, he is required to know the design is correct to most efficiently perform its function. Then he must build the tool accurately according to this approved design. In both of these exceedingly important phases of the process he is in full control of the situation, but equally important are two others over which he may not exercise the same degree of control. These are the selection of a tool steel whose properties will give assurance of long, trouble-free production and the heat-treating procedure.

Mr. Palmer states the case when he says: "Most of the tool maker's difficulties

Frank R. Palmer

arise in . . . selecting the proper tool steel. There is less known about this subject than about any of the other three. Tool makers look in vain in textbooks for the type of information that they need on the subject of tool steel. Dozens of metallurgical books dealing with constitutional diagrams, microstructure and other fundamental data are available, but this is not what the tool maker wants to

Roll Cogging 10" Square Ingots Into Round Billets on 22" Mill.

A 10" square ingot yields a 4" square billet about six times as long as the original ingot.

know. A much more useful type of literature is found in the catalogs and publications of the tool steel manufacturers. These catalogs describe each of the various brands of tool steel that the manufacturer makes, setting forth its properties, its uses, and its heat treatment. It is necessary for the tool maker to translate these descriptions into the requirements of his tool, and then try to decide which one seems to best fit the problem. His decision is made doubly difficult by the fact that there are offered in America today hundreds of different brands of tool steel—made and sold by dozens of different manufacturers and jobbers. While it is true that many of these different brands could be grouped according to their analysis, yet this is no guarantee that they are strictly 'interchangeable.' When faced with a tooling problem, what chance has a tool maker of reading the description of a great many steels and selecting the one which will prove best and most economical for his purpose? Experience over many years shows that there is tremendous need for simplification in this phase of tool making.

In the heat treatment of tools there is again need for simplification. Treating instructions given in catalogs—or even by letter—must necessarily be very general. A typical instruction would read somewhat as follows:

'In heat treating tools made from our . . . brand of tool steel, proceed as follows. Heat slowly and uniformly to 1500/1550° F. and quench in oil. Draw the tool to suit requirements. A good average drawing temperature would be 400°F. but either higher or lower temperatures may be used, depending upon the nature of the tool and the work it must do. The hardness values to be expected at various drawing temperatures are given in the following table . . .'

It would seem that heat treating instructions could be more specific than this, but considering the fact that the steel maker is generally hundreds of miles from the tool room where his steel is being applied, and usually knows nothing whatever about the job, it will be appreciated that only the most general instructions can be given. However, looking at the subject from the tool maker's standpoint, what is he supposed to do? Is he supposed to make up a number of tools and heat treat them in different ways in order to find out which heat treatment will work best? This might be a practical procedure on a simple tool like a boiler punch, but think what it would mean on a complicated and expensive tool which might easily cost several hundred dollars to make. Unfailing accuracy in selecting the ideal heat treatment for all tools is not to be expected—however, a simplified procedure that would even reduce by half the amount of cutting-and-trying would represent a great saving to tool steel users.

As it is, the difficulty in arriving at exact heat treatment recoils upon the selection of the tool steel. Suppose the first tool made does not perform satisfactorily—has the wrong steel been selected, or has the wrong heat treatment been used? More often than not, the tool maker is so disgusted by the failure that he decides the tool steel is no good and proceeds to try something else. Since this involves reading more catalogs, picking another steel, and deciding upon another heat treatment, it is small wonder that many tool makers finally get into a frame of mind where they refuse to try anything."

The TDM Contract Shop owner in reading this probably makes the mental reservation that all of these elements do not enter into every job he takes, because frequently the customer will furnish the design or he will specify or supply the steel to be used, or both, which apparently relieves him (the TDM Shop owner) of such responsibility, but the fact still remains that someone has had to assume these responsibilities, and mistakes, if made, will prove just as costly regardless of whether the TDM Contract Shop or the production manufacturer has the last word. *Both* should be thoroughly acquainted with all the factors which enter into the building of tools and dies to assure them the longest possible, efficient life and the selection of tool steel and its proper heat treatment. There is no work on this subject that compares with Mr. Palmer's. It is a veritable textbook.

Beginning with easily understandable definitions of the technical terms and descriptions of processes which enter into tool steel manufacture, he carries the reader through chapters which will hold the interest of every man who has any-

(Continued on page 25)

Trials and Tribulations of a Jobbing Shop Designer

By EDWARD HELLER, Chief Tool Engineer
The Ohio Tool Company

THE mechanical designer of an orthodox, well settled manufacturing establishment, has quite a few problems to solve as a part of his daily duties and routine, but after a time the problems begin to be more and more of a like nature and the solutions are largely and easily found in an accumulation of past experiences.

Not so with the designer of the jobbing shop. To begin with, his problems are never the same, not even by the most liberal stretch of the imagination are they similar from day to day, and from month to month. His problems are multiplied also, because of the fact that he has to deal so much with people whose interests, experience, needs and wants, are as different and as far apart as the East is from the West.

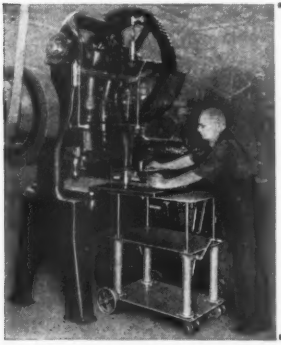
For instance: the customer who believes that a cut is the only means for clamping a job on milling, can't easily be led to believe that a nut operated with a wrench might do as well, or better, under circumstances. The man who swears by a certain kind of tool steel for his dies will find it hard to believe that other people use, successfully, a different kind of tool steel for a job very much like his.

Similar differences appear in every phase of mechanical work. Where one customer prefers a chain for driving a certain mechanism, another will insist on solid gears. While one client will insist that anything that revolves must do so in anti-friction bearings, another will be content with ordinary bronze bearings, even for moderately high speeds.

And while all these various views by customers are in most cases justified, and prompted by reasons emanating from the particular industries the customers are engaged in, it, nevertheless, throws a heavy responsibility on the jobbing shop designer, inasmuch as he must keep these different interests and requirements catalogued and carefully indexed in his mind, so that he may be of the utmost service to each and every one of the customers in the customer's particular field or industry.

At this stage, the J. S. D. excells the local designer by a great many points. The jobbing shop designer, whose experiences are always many and varied, will often apply a solution from one kind of business to the problem of another business, benefiting one without hurting the other. The jobbing shop, as an institution, is one of the safest one-way receptacles for a customer's confidences and business trusts, and anyone, connected with the establishment, would no more think of betraying those trusts

(Continued on page 42)



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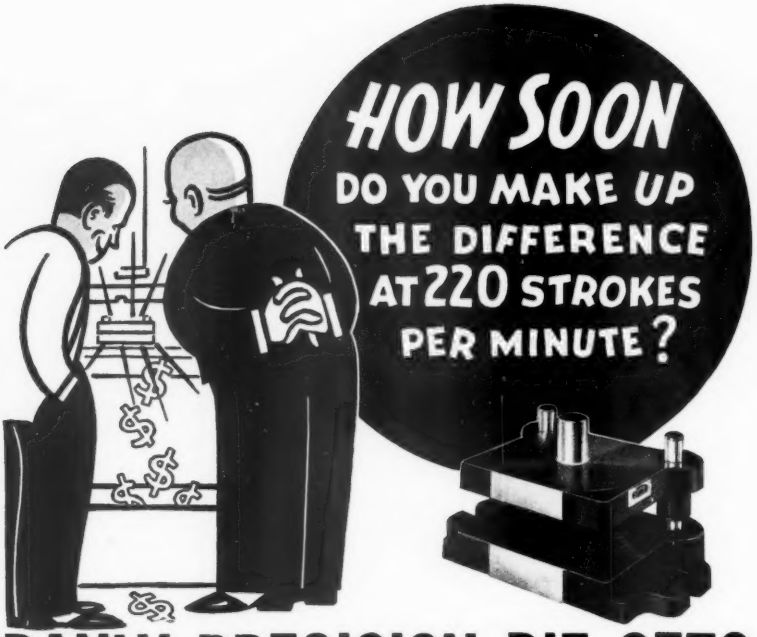

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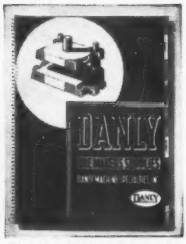

The Danly Catalog makes it easy to select the proper die set for the job at hand. Ask for your copy.

● True, you pay a little more for a Danly Precision Die Set because the guide posts and bushings are perfectly fitted to within ± 1/10,000″. That's what gives you the absolute accuracy of die movement that means perfectly made parts. It's one of the reasons why Danly Precision Die Sets can operate at a higher rate of speed—produce more parts before regrinding—protect the dies, as ordinary sets can't. Try a Danly Precision Die Set next time and prove to yourself the difference in long-time economy.

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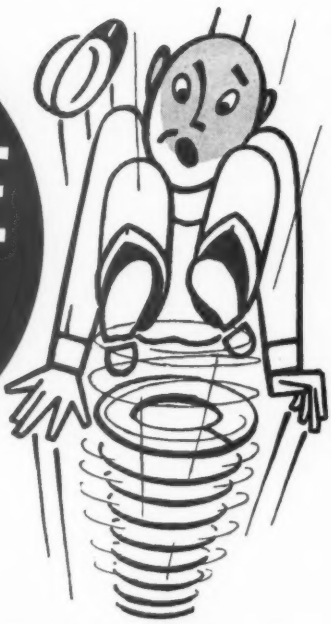
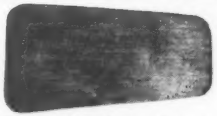


You'll get plenty of kick out of these new Danly flat rounded springs—they're new and entirely different—livelier—stronger—longer lasting! They're engineered to combine a maximum flexibility with carrying capacity and compression.

DANLY FLAT ROUNDED DIE SPRINGS

● **The reason they're better lies in the fact that they are made of a special analysis keystone wire which, in destruction tests covering three years, showed the highest fatigue life ever known in spring steel. The keystone wire when coiled, takes a rectangular cross-section to give it equal strength on both inside and outside spring diameters—greater carrying capacity for hole size. It means longer life and fewer spring replacements for you.** ***The new Danly Spring Chart describes it more fully. Send for your copy today.***



The special analysis steel wire is drawn in this keystone shape.

When coiled, it takes this shape to give it greater strength, longer life. When you start with ordinary flat wire the exact reverse is true.

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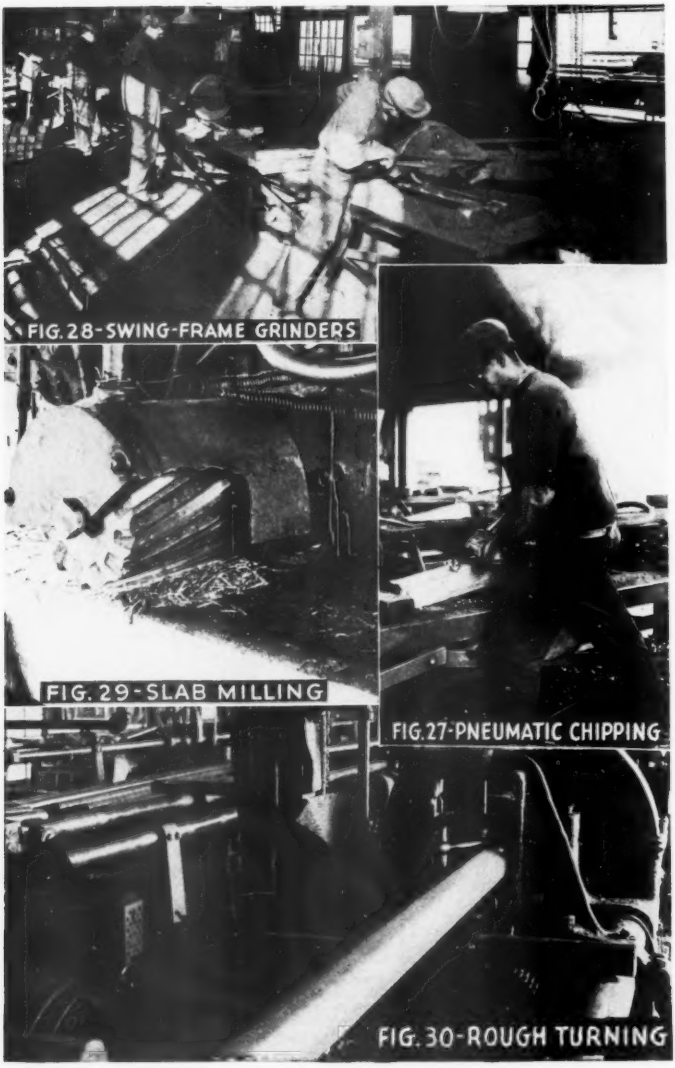
Action Shots of Methods Used in Preparing Surfaces of Tool Steel Ingots and Billets.

Courtesy—The Carpenter Steel Co.



When casting liquid steel in molds, splashing and the motion leaves the surface quite rough. In the process of cogging into billets these surface imperfections stretch out into seams. Four methods for removing these are: Fig. 27, after pickling to remove scale and define seams, they are gouged or chipped out; Fig. 28, swing frame grinders are used on hard steels like high-speed; Fig. 29, removing entire surface with a slabbing cutter; Fig. 30, when desirable to remove surface completely, billets are rolled round and put through rough turning machines.

"Tool Steel Simplified"

(Continued from page 20)

thing at all to do with metal working. He says, "It is not necessary to have detailed knowledge of all the technicalities of tool steel manufacture in order to be a good tool maker. On the other hand, ignorance of the significance of certain common terms that are likely to be encountered—both in reading and in conversation—is likely to prove embarrassing to a man who is responsible for the selection, purchasing or working of tool steel." And so he proposes "to fortify the tool maker, and others who may be concerned in the selection of tool steel, with sufficient general knowledge so that they will be able to avoid costly and foolish experiments on one hand, and the rut of obsolete practice on the other."

In this chapter defining tool steel terms and manufacturing processes are shown numerous interesting illustrations, some of which we are privileged to reproduce herewith.

At the beginning of this review we asked the simple question: "Why are alloys put into tool steel?" The answer to this question may not be difficult for many of our readers but it is typical of Mr. Palmer's simplified treatment of the subject when he brings out in the chapter, "The Analysis of Tool Steel" that all of these *extra* requirements can be assembled under the four heads quoted.

Carbon, manganese, silicon, phosphorus, sulphur, chromium, nickel, tungsten, vanadium and molybdenum are alloy elements, each of which has its effect—usually beneficial but sometimes otherwise—when it becomes a constituent of an alloy tool steel.

"Tungsten is the most dramatic alloy to be found in tool steel," probably because it is one of the leading "actors" in the production of modern *high speed tool steel*, which Mr. Palmer designates "the most important alloy tool steel in existence." The closing words of this chapter about these alloys are significant: "The more different alloys added—and the greater their quantity—the more difficult it becomes to keep the steel uniform and hold it under accurate control. Other things being equal, the steel having the simplest analysis is the one to be preferred."

(Continued on page 28)

SAVING by cutting all die parts in one operation illustrates a striking advantage gained by users of DOALL Contour Sawing. As the American District Telegraph Company says of their DOALL operations, "Two days' work in two hours." Similar remarkable savings are reported by such companies as American Stove, Curtiss Airplane, Stevens Arms, General Electric, General Motors, and American Can. DOALL, the adaptable tool, is easy to investigate, simple to put in operation, quick to pay for itself. It belongs in every tool room.

JOB SELECTOR DIAL

The DOALL Contour machines are equipped with the Job Selector Dial, enabling operators to quickly determine the saw or file speed and other specifications for most efficient cutting. This exclusive DOALL advantage is one of the many features that bring enormous savings to DOALL users.

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Center Finder Eliminates Uncertainties of Old Cut and Try Method

TO accurately and quickly locate the exact center of a hole in order to bore other holes in correct relation with it is, by ordinary old-fashioned methods, a troublesome job.

If this operation is not performed with precision and certainty where accuracy is necessary, it may ruin an expensive piece of work.

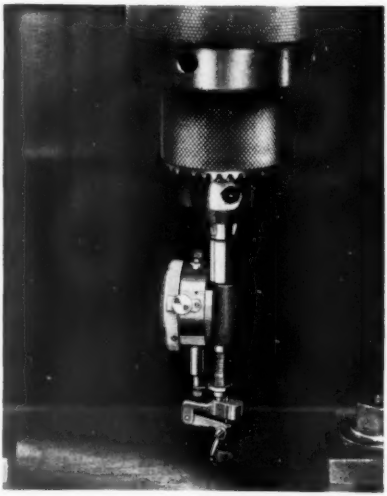
The old "cut and try" method which attempts to obtain accurate readings at four positions around a hole or jig button from an indicator "uncertainly" attached to the machine spindle is almost always inaccurate. But even though the degree of accuracy required is obtained, this method usually involves an hour or more of time.

In contrast, an exact center can be located with a Schwieterman Center Finder in a matter of a minute or two and what is of even greater importance —within .0002 inch. This Center Finder device is designed to accurately locate the spindle of a jig boring machine, a vertical or horizontal milling machine, a vertical or horizontal boring mill, drill press or any other similar machine in the exact center of a hole, plug or jig button right on the work, either for the purpose of re-boring an old hole, getting a location from which to bore additional holes with relation to an old hole, or for locating holes in new work as with jig buttons or master plates.

The entire operation of finding the center is performed while the spindle is rotating under power at the exact speed and under the same conditions of spindle crawl, etc., which will prevail when the hole is actually bored, thereby insuring the greatest possible accuracy.

The indicator is so mounted that while the spindle rotates the feeling-finger in contact with the hole or button, the indicator may be held stationary by the hand so that the dial is presented to view. Thus, the operator may hold the indicator with one hand and while the spindle is in motion adjust the work table with the other, locating the center almost immediately. After a first hole, the location of additional holes with precise relation thereto may be determined by means of the micrometer equipment with which such machines are usually provided.

Center Finding has heretofore been a difficult job accomplished usually with the expenditure of considerable time and effort and then often with very sad results as to accuracy. Errors are bound to occur when readings taken while rotating a spindle slowly by hand are expected to govern and be accurate when the spindle is being rotated under power at the speed the boring is to be done.



The center is located while the spindle is rotating under the exact conditions which prevail at time of actual boring or drilling.

An interesting technical circular describing this device and its application to die, jig, fixture and gage making; checking alignment as on turret lathes; also how it overcomes the inaccuracies of worn milling, boring and drilling machines may be had from the manufacturers, the Precision Gage and Tool Company, Department GH, Dayton, Ohio.

New Speedmill Has Unusual Features Including Depth Warning

THE *Midgetmill* is the newest member of the unusually efficient line of Dalrae Speedmills designed to broaden the work range of the standard milling machines.

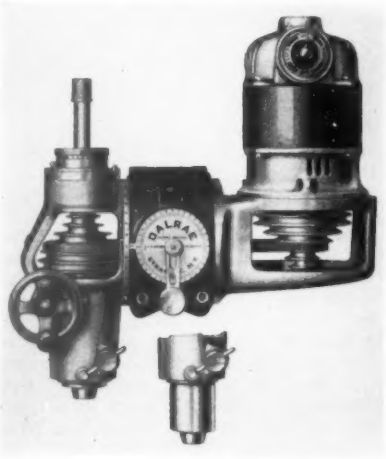
This new *Midgetmill* has its high speed spindle housed in a hardened and ground quill, and has a 2½ inch travel.

Boring and drilling feeds are obtained with hardened worm and bronze worm wheel with internal screw thread which fits accurately a ground screw thread on the quill. Extreme smoothness of feeding action is claimed.

The ground steel sleeve and quill members give added rigidity that eliminates chatter and vibration under maximum cuts regardless of spindle position.

Other features common to the Standard Speedmill—balanced design, flywheel type of spindle pulley, spindle lock, ejector rod, self-contained plumb bob, single mounting for any compound angles, light

(Continued on page 41)



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"Tool Steel Simplified"

(Continued from page 25)

"A purchaser of tool steel should realize that different degrees of soundness exist in different pieces of tool steel, and that certain types of ailment are detrimental to tools made from the steel." Thus it behooves the buyer to make certain "that the particular piece of steel he is buying is eternally sound." Methods used by the manufacturer to determine the soundness are described and illustrated.

We learn that tool steel has personality—timbre is the word for it as adopted in the research laboratory of The Carpenter Steel Company. That "something" in tool steel which affects its behavior has been variously referred to as "body", "nature", "quality", but Mr. Palmer explains: "Since the significance of these older terms was not very clear, it became desirable to pick out a new word to describe this property which was now being tested, measured and controlled. The word 'timbre' was borrowed from music where it is used to distinguish between the character of tone produced by various different musical instruments or voices." Timbre in tool steel, then, is that property "which controls the grain size and hardness penetration developed by hardening." What causes timbre? Is timbre something put into the steel? How is timbre determined? What names are given to these different timbres? Can the timbre of steel be changed? Interesting questions —all of them. Interesting answers too long for us to do more than comment upon as highly informative.

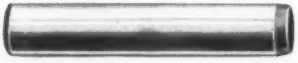
Some of us play with carefully matched golf clubs. We may not be certain who originated the matched set in golf, but in tool steels it was Carpenter.

"What kind of tools should be made from WATER-HARD (plain carbon tool steel)?"

In the answer we have the first rule of the Carpenter Matched Set Method: "All tools should be made from WATER-HARD unless there is some good reason for making them from something else."

WATER-HARD, Mr. Palmer explains, should be "home" to the tool maker. Al-

STANDARDIZED
DRILL JIG BUSHINGS
LEADER PINS *and* BUSHINGS
DOWEL PINS



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ways it should be the starting-place and other destinations become important only as they can prove their greater desirability, thus the Carpenter Matched Set diagram says: Travel North to secure greater wear resistance; South for greater toughness; West for greater hardening accuracy; and East for greater red-hardness. When you arrive, in each instance you should find the right tool steel for the job.

Use your imagination a little, says Mr. Palmer. "Suppose the tool maker is thoroughly acquainted with WATER-HARD—but knows nothing whatever about any other kind of tool steel. Let us imagine that he keeps in his tool box a pepper shaker containing a magic powder labeled 'Wear Resistance.' When he comes to a tool requiring greater wear resistance than can be secured with WATER-HARD, he simply cuts off a piece of WATER-HARD steel and sprinkles the magic powder over it. This adds the extra property that he wants but changes nothing else. He now has a piece of steel that will behave in every respect like the familiar WATER-HARD steel—excepting that it will wear in service many times longer.

"Suppose again that he had another pepper shaker labeled 'Toughness'. Confronted by a tool that would break in service when made from WATER-HARD, he would simply sprinkle his steel with this magic powder—nothing else would change—and he would be able to make a tool many times tougher than he had before. It is perfectly obvious that the tool maker would not need to know the formula for his magic powders—just so they worked.

"The above story is not as fantastic as it seems. In real life, there are no magic powders but there are alloys which can be put into steels when they are melted and thus add the extra properties that were conferred by the magic powders."

Selecting the steel best suited for a specific tool or die is always a responsibility, we repeat. After the tool or die builder has a thorough understanding of the qualifications which must be built into his finished tool, he is confronted with this choosing of his steel. The more nearly mechanical or according to a formula it can be, the easier it should become.

Using the illustrations in this review,

(Continued on page 32)

AN *ENTERPRISE* OVERHAUL
is a machine rebuild from the ground up, plus a Guarantee of New Machine Operation

- Years of experience in this specialized field have developed an organization capable of rendering this service most efficiently and economically.
- We offer this expert service to *Tool & Die Shops* with the assurance of faster, more accurate work on old machines, and to *Production Manufacturers* with the assurance of larger volume.

BOTH SPELL MORE PROFIT

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A Unique Service for Tool-Die Shops and Production Manufacturers

A HIGH production unit requires rebuilding when it no longer maintains the production rate of which it is capable, or the accuracy of a new machine. In tool and die shops excessive wear of machine tools invariably brings inaccuracies which cannot be tolerated in fine tool and die building. Thus we reach the indisputable conclusion that both production and tool making equipment must continually approximate new machine operation, and an overhaul must restore original efficiency and accuracy if it is to be of real value.

Machine-overhaul is so often thought of as a "tear-it-down, put-it-together-again-when-you-have-time" sort of proposition and it frequently occurs that such a job, begun when there is a temporary lull, has to be abandoned when the demand for production suddenly returns with a bang. A production unit in process of overhaul is not an earning unit.

But now machine tool overhaul has been developed into a specialized business. Two factors brought it home to the management of Enterprise Machine Parts Corporation of Detroit that "overhaul" could become a business of substantial volume. And it has.

One of the first essentials is a stock of replacement parts when they are standard or semi-standard, and when not, then the facilities for prompt manufacture of such parts. Included are crankshafts, spindles and bearings, boring bars, lead screws, cams, worm gears and all of the numerous small parts necessary.

A second essential is a shop especially equipped for the efficient handling of both heavy and light machines; as an example, there should be boring mill equipment with capacity for boring out the largest machine tool bearings.

(Continued on page 42)

"A wheel for every need". . . backed by 37 years' experience

SAFETY WHEELS FOR PRODUCTION AND GENERAL PURPOSE WORK ON PRECISION MACHINES...CYLINDRICAL...SURFACE . . . FACE AND CENTERLESS GRINDERS

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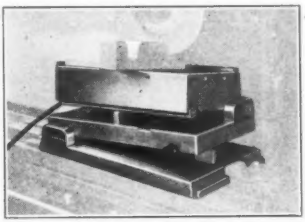
New Pneumatic Die Cushion Adaptable to All Punch Press Work.

THE basic design of this device is a heavy cast alloy cylinder which may be clamped directly to the press bolster plate for shallow drawing purposes. For compound blanking it may be placed clear of the bolster plate by using spacing studs.

The long piston, having a hardened and ground top face to receive the draw ring pins, is guided by a generous size piston stem protruding through the bottom of the piston cylinder. The end of the threaded piston stem is provided with a precision adjusting hand wheel that predetermines the height of the piston face when the piston is at rest. This eliminates the necessity of correcting the length of the draw ring pins or stripper rods on compounds. This hand wheel adjustment is not only used to an advantage on the drawing dies, but it is very readily brought into use in adjusting the stripper to the correct height after the compound punch is ground, thus assuring that the stripper will be at its correct height in its free or idle position.

Each pneumatic cushion unit is self-contained, having its own air chamber and taking air directly from the air line, consequently, the necessity for

(Continued on page 39)



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. . . . have been reduced in every shop in which the MAGNA-SINE is now being used. It is adjustable, in a few seconds time, to any angle—either single or compound—with absolute assurance of precision accuracy. Learn how it will cut production time—yet offer the maximum in satisfactory results—when used on *your* grinders. Write for complete details!

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"Tool Steel Simplified"

(Continued from page 29)

let us follow Mr. Palmer's line of reasoning to arrive at some selections.

Figure 1 illustrates a ring die for drawing a cup to be made of 23-gage steel. Consideration of all factors entering into the use of this draw die, indicate that there are no cracking hazards, that it is easy to grind after hardening, therefore size change does not become a serious problem and that WATER-HARD is the steel to use. If production requirements are large and longer die wear is required, the Matched Set Method indicates WATER-WEAR.

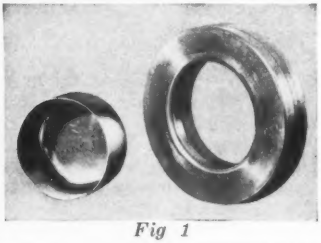
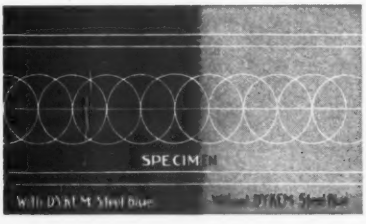


Fig 1



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making dies & templates

Simply brush on; ready for the layout in a few minutes. The dark blue background makes the layout lines show up in a sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

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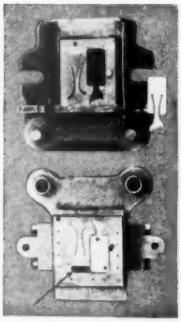

Fig. 2

Figure 2 is a progressive blanking and stamping die, the arrow indicating a letter stamp in the punch holder. The curved slots are perforated and the letters stamped in the first stage; the blanking is done in the second. The material is galvanized iron.

"Why not use WATER-HARD? A water-hardening steel would be hopeless for the punch or die—cracking hazard, warpage and accuracy are all involved.

"The lettered stamp can and should be made of WATER-HARD. OIL-HARD could be used but it would not last as long as WATER-HARD and an oil-hardening steel is not needed here.

"The die must be made from an oil-hardening steel and either OIL-HARD or OIL-WEAR is selected, depending on production required per dressing, since no superior toughness is required on this light gage material.

"The thin curved punches are an interesting problem. On very light material OIL-HARD or OIL-WEAR would be O. K.—if any breaking or chipping were encountered in service, go south for greater toughness and use OIL-TOUGH.

"The large rectangular punch would be the same steel as used in the die."

Illustrated in Figure 3 are two 3 inch diameter rolls for rolling a bead on a stainless steel strip .008 inch thick. The edge on the bead is very thin. "When made of carbon tool steel, the thin bead cracked in hardening, so they followed the arrow to OIL-HARD for 'greater hardening safety.' When made of OIL-HARD, the bead stayed on in hardening safe enough, but when placed in service the strain was too much for the thin sections in this hard steel, and the edges chipped.

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Our Precision equipment includes: No. 2 Pratt & Whitney Jig Borer
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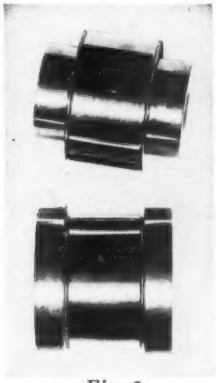


Fig 3

"So the tool maker said, 'Now what I want is greater toughness'—and he followed the south-bound arrow to OIL-TOUGH. Made of OIL-TOUGH, they had made 'miles' of molding when this picture was taken and the bead is still there."

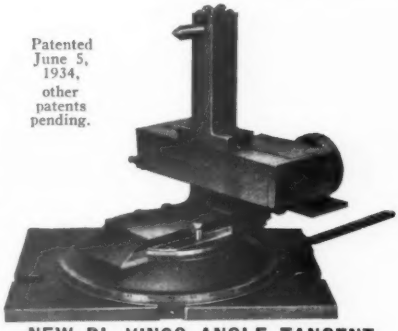
"Heat Treating Methods and Equipment"; "Hardness and Toughness Testing," with descriptions and illustrations of instruments best adapted, are chapters which deal with their subjects technically but understandably.

An unusually interesting chapter is one entitled "Quenching". Here the author says "Quenching is one of the most important—and least understood steps in the heat treating operation. Anyone who has ever seen a piece of hot tool steel disappear into a quenching tank, and come out a few seconds later cold, can appreciate how difficult an operation it is to study. However, when he further considers that it is at this stage that the steel hardens—and further, that warpage, size change, cracking, internal strains, and soft spots are all products of this operation, he gains some idea of its importance.

"There are possibilities in the quenching tank that the hardener does not realize—let alone apply. It is common knowledge that quenching produces *internal strains* in a piece of steel—forces that are sometimes powerful enough to smash a piece of hardened steel whose strength may measure close to 400,000 lbs. per sq. in. If forces of this magnitude can be developed in quenching, why not devote some effort to making them *useful* instead of destructive? This is exactly the same thought that went through Benjamin Franklin's head when he tried to harness a bolt of lightning with a kite string. Practically, control over internal strains in tool steel is secured by the use of quenching fixtures that will put the

(Continued on page 37)

Patented June 5, 1934, other patents pending.



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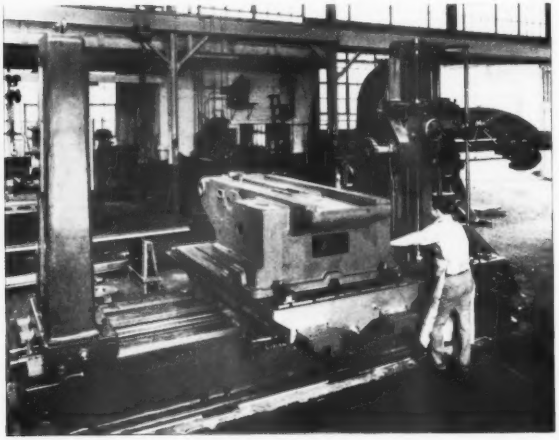
T·D·M Shops Continue To Buy New Machine Tools



A new Universal Boring Machine Goes to Work on a Jig Borer.

T-D-M Industry Shops continue to report purchases of new machine tools and many other items of modern shop equipment. Equipment which is designed to more effectively machine the ever larger dies, jigs, fixtures, etc., which modern manufacturing requires is one type most frequently installed while the other is that group of new machines and attachments which has inaugurated new methods for old—designed to do more accurate work in less time.

Illustrated herewith is a Universal Boring Machine just installed by the Hahn Manufacturing Company of Cleveland, builders of large dies and machine parts. In this instance, the machine is about ready to start a milling operation on a jig boring machine bed.

The Boring Machine has a 5-inch spindle with continuous traverse of 36 inches which is increased to 72 inches when reset. Maximum work height is 60 inches, length 10 feet. Overall dimensions of table are 55 x 91 inches, coolant type. One-shot oiling systems lubricate both the rear post and the table.

Let **LYONS** *make your* **CARBOLOY TOOLS**

Carboloy, the paragon of cutting materials, has hundreds of other applications. It is superior as a wear and abrasion resistant—for guides, arbors, gaging anvils, jaws, etc.

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The Business Outlook

As Reported in The Cleveland Trust Company's May Bulletin

"As long as these fundamentals continue as they are going we need not fear that there will be a serious recession for business in general."

"EXCEPT for the strikes we have been having an almost unbroken series of reports of increased production, greater volumes of trade, higher earnings, more construction, and favorable agricultural prospects. Nevertheless, stock and bond prices have had an important decline, and the quotations for many sorts of commodities have moved downward. The result has been a harvest of gloomy warnings about an impending decline in general business.

"It seems wholly doubtful that any such pessimistic forecasts are warranted. The iron and steel industry is producing at close to capacity volumes, and has so large an amount of forward orders on its books that it will apparently be able to continue at nearly full activity for many months to come. The automobile makers are having another big year. Construction is not expanding vigorously, but it is doing better than it did last year. The railroads are carrying more freight and making more money. Retail trade is improving. As long as these fundamentals continue as they are going we need not fear that there will be serious recession for business in general.

"It now seems probable that both the volume of business done and the totals of profits earned by business in general will be greater in this second quarter of this year than they were in the first quarter despite disconcerting changes in commodity and security prices. Employment will almost surely be larger, and the totals of payrolls distinctly higher. Railroad traffic will be greater in volume. Under these circumstances the prospects for the year as a whole appear to be promising rather than disquieting."

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COLONIAL
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New High for Machine Tool Orders

NEW orders reported by members of the National Machine Tool Builders' Association in the month of April reached a total volume ten per cent higher than the peak in December, 1936.

An interesting phase of the situation is that the big gain was in orders placed by American buyers, the increase reaching 33⅓% over March. Foreign orders were greater than in March but under December.

President of Continental Machine Specialties in Europe

L. A. WILKIE, President of Continental Machine Specialties, Inc., manufacturers of Doall Contour Sawing and Filing Machines is in Birmingham, England, cooperating with George H. Alexander Machinery, Ltd., who are Continental representatives in the British Isles.

British manufacturing interests are reported as keenly interested in this new, highly successful American method of metal shaping.

The PENINSULAR STEEL COMPANY

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Die and punch making, die sinking, sheet metal working, manufacture of special tools, sub-presses, devices and mechanical combinations for punching, cutting, bending, forming, piercing, drawing, compressing and assembling sheet-metal parts and other materials in machine tools are fully covered.

DIES: THEIR CONSTRUCTION AND USE FOR THE MODERN WORKING OF SHEET METALS.
By JOSEPH V. WOODWORTH. Seventh revised edition. 426 pages. 546 illustrations ------$4.00
A book by a practical man. Contains detail description and is well illustrated with photographs of work in process.

MATHEMATICS AND THE MACHINIST'S JOB. THE PRACTICAL MATHEMATICS OF THE MACHINIST'S TRADE.
By FRANK CUSHMAN, Chief Trade and Industrial Education Service, U. S. Office of Education. 226 pages. 134 figures. Cloth ----------$1.75
Begins with arithmetic and extends through the essential part of trigonometry, using practical shop data and concrete experiences.

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THE BISSETT STEEL CO., CLEVELAND
Manufacturers of BISCO *Tungsten Carbide Dies and Tools.* • *Fine Tool Steels.*

"Tool Steel Simplified"

(Continued from page 33)

coolant *where* it is wanted—*when* it is wanted."

In a general way most users of tool steel know the four fundamental laws of quenching, but Mr. Palmer points out that they must be understood. Here they are:

1. Steel is stronger cold than hot.
2. Steel expands when heated and contracts when cooled.
3. Some tool steels increase in volume when hardened.
4. All steels have the same elastic properties—regardless of composition or heat treatment; they will stretch exactly .001 inch per inch under a load of 30,000 lbs. per sq. in.

Our space does not permit quoting the interesting experiments and explanations contained in this chapter. Its value to tool and die manufacturers who do their own heat treating cannot help but be considerable.

We sincerely recommend Frank Palmer's new handbook, "Tool Steel Simplified" to every man interested in the use of tool and die steel, either as a builder of Tools, Dies and Machines or as a user of them. It is a book for the executive and the worker. Its simplicity of expression, its easy understandability make it ideal for distribution to shop men who may not have had the advantages of higher technical instruction.

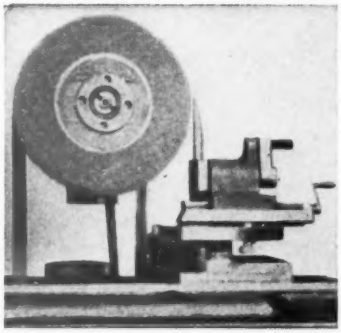
"Tool Steel Simplified" is a valuable contribution to the industrial literature of the world. We congratulate Frank Palmer.

Star of Cleveland Buys New Equipment

Among recent installations the Star Machine & Tool Company of Cleveland reports:

1 Continental Doall Contour Sawing and Filing Machine
1 Cincinnati 24" Shaper
1 Foote-Burt Drill—large table
1 Internal Grinder with Ex-Cell-O Spindle
1 Ecklind High Speed Vertical Milling Attachment

THE ROYAL DRESSER



. . . quickly and accurately dresses grinding wheels in Concave and Convex forms, Angles and Radii or combinations.
Time saved by not having to set up inadequate fixtures easily pays for the Royal. *Write for circular and price.*

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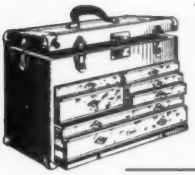

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A High-Speed Automatic-Loading Broaching Machine

An interesting development of a high speed automatic-loading broaching machine is illustrated in Fig. 1.

The general adoption of adjustable front seats for automobiles brought with it a machining problem in connection with the adjusting mechanism. It is customary to provide in these seats, cross rods on the ends of which are mounted gears which roll back and fourth on a concealed rack when the seat is adjusted forward or backward, maintaining alignment of the seat and facilitating adjustment without undue friction.

The gear carrying rods must have their ends machined for the mounting of the gears and in some cases this is done by machining flats top and bottom on each end. Due to the length of the rod, milling is rather cumbersome and slow for this operation. To solve the problem Colonial Broach Company adapted its high speed horizontal automatic pushers to broaching of the ends in one operation. Rods may be seen in the magazine ready to drop down into the work carrying fixture. These rods are released into place automatically two at a time and are ejected at the end of the stroke completely finished.

The cycle is entirely automatic with continuous operation as the rods drop down into the fixture, which carries them through the broaches shown in Fig. 2. The broaches are arranged first to rough-shear the ends of the rods to length, about $\frac{1}{32}$ inch of stock being left

Fig 1

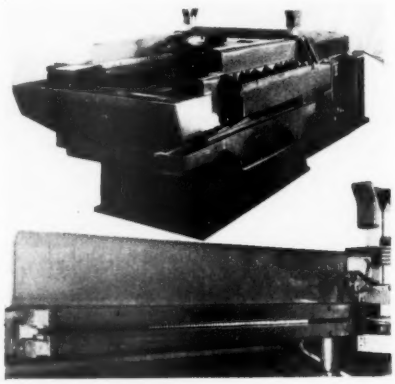

Fig 2

on the rods for this purpose. The machine automatically equalizes the rods so that the same amount of stock is removed from each end, then cuts Vee slots in both ends to permit spreading to lock on the assembled gear and finally the two flats on each end are broached. All of this is done in one stroke, after which the rods are automatically kicked out. The ram feeder then returns to pick up two more blanks. The machine is hydraulically operated with a cutting stroke of 30 feet per minute and a fast

(Continued on page 39)

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*See larger display advertisement also.

Pneumatic Die Cushion Adaptable To All Punch Press Work

(Continued from page 31)

auxiliary air tanks is eliminated. It is also provided with a pneumatic hose connection from the regulating valve, with a pressure gauge recording the amount of air pressure used on each job.

The cushion is designed so compactly that it may be easily installed on the bottom side of the bolster plate through the hole in the bed of the punch press.

For drawing purposes the cushion is fastened to the bolster plate with four cap screws. For compound blanking and piercing four spacing studs are used to allow for slug clearance between the top of the cushion and the bottom side of the bolster plate. In both cases, rigid and accurate alignment is always assured.

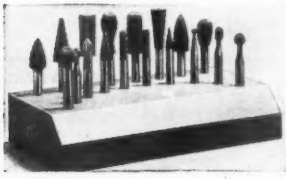
Dayton Rogers Universal Die Cushions are made in seven different sizes with piston diameters from four inches to fourteen inches, adaptable to working pressures from one-quarter ton to eight tons on airline pressures from twenty pounds to one hundred fifty pounds and with a maximum drawing capacity of two and one-half inches.

A special descriptive Bulletin DC may be had by writing the Dayton Rogers Manufacturing Company, Minneapolis, Minn.

Automatic-Loading Broaching Machine

(Continued from page 38)

return of 60 feet per minute, but also has a variable speed control for adjustment to variations in machinability of the bars. Production is approximately 600 pieces per hour, finish broaching both ends from the rough.



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Eighteen standard shapes and sizes made up in five different cuts. Adaptable for all classes of work and for all kinds of materials. Try them on your next job.
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Dayton, Ohio

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Tools, Dies, Jigs, Fixtures, Special Mach'y
The Hamilton Portable Elevating Table

New Speed Mill

(Continued from page 27)

weight characteristics—have been retained.

An ingenious depth stop that "clicks" a warning when desired depth is reached replaces the usual solid depth stop, thereby effectively eliminating cramping precision ball bearings. It is claimed that exceedingly accurate settings are possible. A standard 40 threads to the inch micrometer dial of large diameter for setting is precision built and dependable.

Descriptive circular T-D describing the *Midgetmill* is available upon request to Dalrae Tools Company, Syracuse Building, Syracuse, N. Y.

A New Line of Mill Cut Rotary Files

HAMILTON Mill Cut Rotary Files are the ideal tools for shaping irregular work, such as burring finished machine parts, die sinking, engraving, barbering dies, removing excess welds, finishing brass and aluminum castings and for work on marble, bakelite and wood.

They are used in flexible shafts, drill presses and milling machines. They save many hours of labor, thus cutting costs and earning dollars.

The speed at which these files are most efficient varies from 800 to 5000 RPM depending upon the material to be cut and the diameter of the file. A speed of 1725 RPM is considered a good speed for average size files and work. Small diameter files naturally must be run faster than those of larger diameter.

Hamilton Tool Company, Hamilton, Ohio, is now manufacturing mill cut rotary files in twenty-two standard shapes and five standard cuts.

A high carbon tool steel, especially for rotary files, is being used, except when work requirements are unusually "tough" and a file speed exceeding 2500 RPM is required, in which case high speed steel is used. Illustrated circular will be furnished upon request to Department T-D.

The New Sawing and Filing Machines Are Versatile

The use of metal sawing and filing machines for die work is not new but there have been vital improvements in the last several years. The so-called die-making machine as developed by one manufacturer at least has become a contour sawing machine adapted in design and construction to production shop requirements as well as those of the tool and die shop.

Such an instance is currently reported by The Northern Pump Company of Minneapolis, Minnesota, who saw 1" nickel steel plates on a production basis on the Doall Contour Sawing Machine at a saving of 75% in time as compared with the former method for which a drill press was employed. Large gears are similarly cut in the same shop.

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Trials and Tribulations

(Continued from page 21)

than he would of putting dynamite under his own front door. But the continuous pouring in of problems into the hopper of a jobbing shop creates a sort of melting-pot of ideas, and the designer who is a "true blue" jobbing shop man (and these are the only ones who stay long in the jobbing shop business), will always manage to reach down into the bag and pull out a workable and practical solution for any tooling or machining problem.

But the solution might be a general one, and not entirely suitable to the particular shop, plant, or industry. It is there where the jobbing shop designer must use his ingenuity to temper it down to the temperament of certain individuals, give it the necessary polish to suit the esthetic inclinations of others, and reinforce it with practicability to withstand the onslaughts of the man who is not afraid to ask pointed questions.

The result is a solution to a problem. The method—putting a great many two's and two's together to make them add up to an equal number of four's.

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Unique Service

(Continued from page 30)

Along with these facilities and the replacement parts, two other essentials go hand in hand—experience and ability. In such an organization there must be men who know machine tool construction from the ground up, and who have the ability to restore original operating precision.

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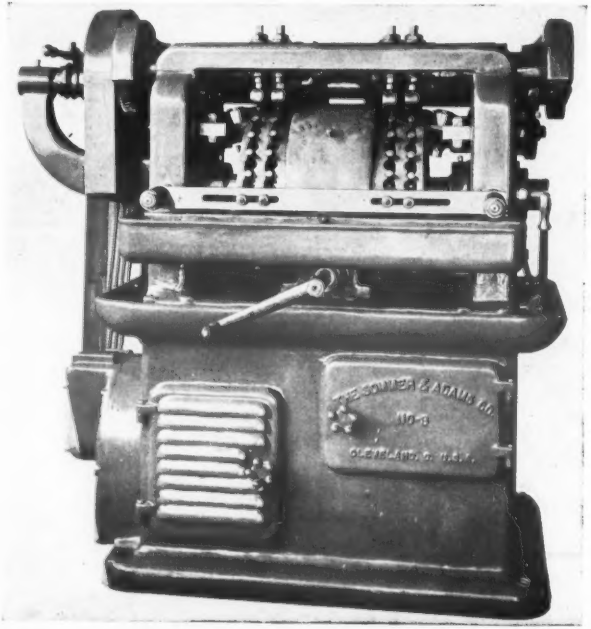

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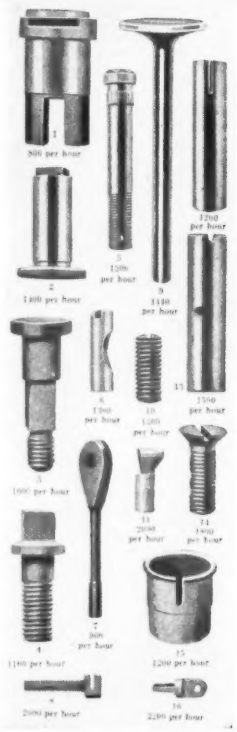

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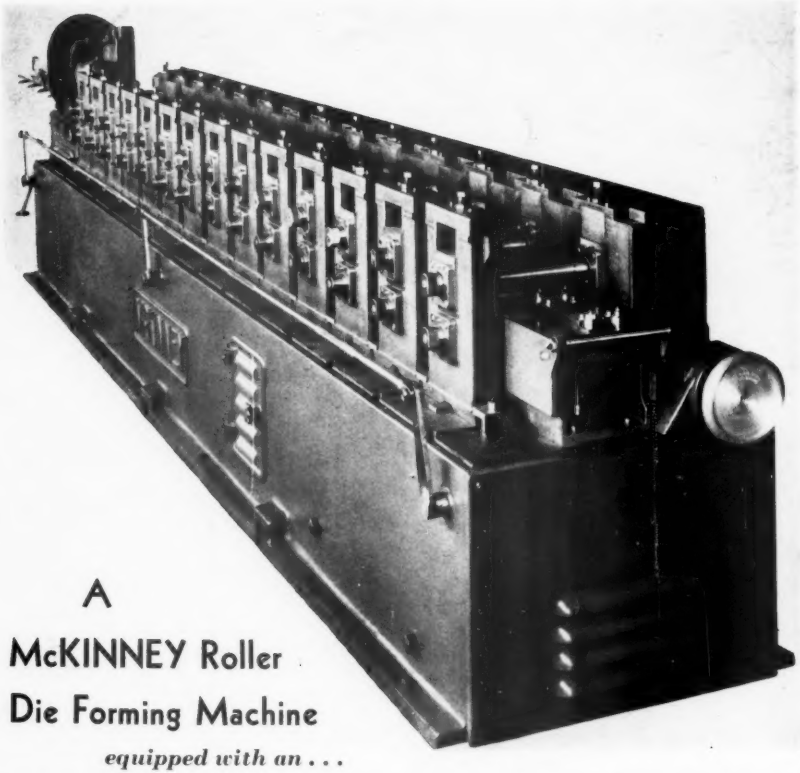

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